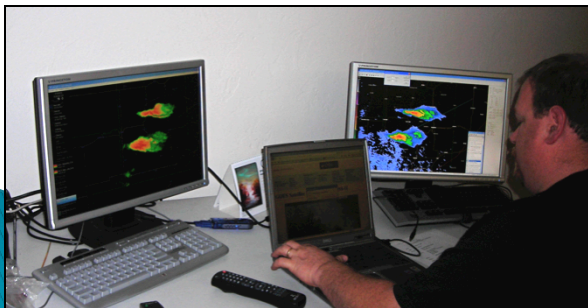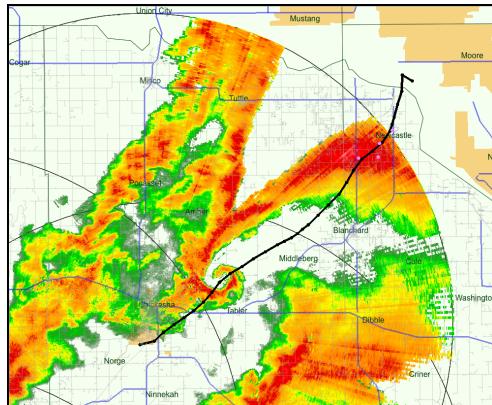# CASA-DFW Urban Demonstration Network

- Background
- CASA Priorities
- Radar Network & Products
- Service/Mission benefits
- Highlighted projects in progress

Tim McClung
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CASA Engineering Research Center: (2003 – 2013)

- 10-year NSF-funded program
- UMass, CSU, OU, UC-Colorado Springs
- Industry & Government Partners
- Testbeds in OK, Puerto Rico, and now North Central Texas
- CASA transitioning to sustaining, post-NSF Funding

CASA-DFW Priorities

1. Hi-res atmospheric mapping

2. Real-time neighborhood scale observation/ forecast of hazards for users.

3. Integrate X-band radar network

4. Pilot federal/private/municipal partnership model for new observation technologies and research
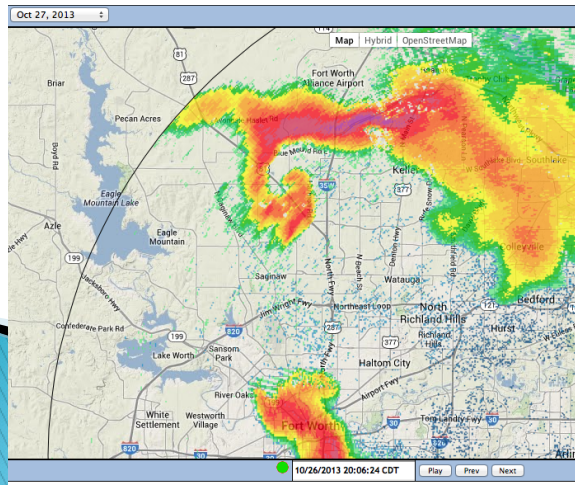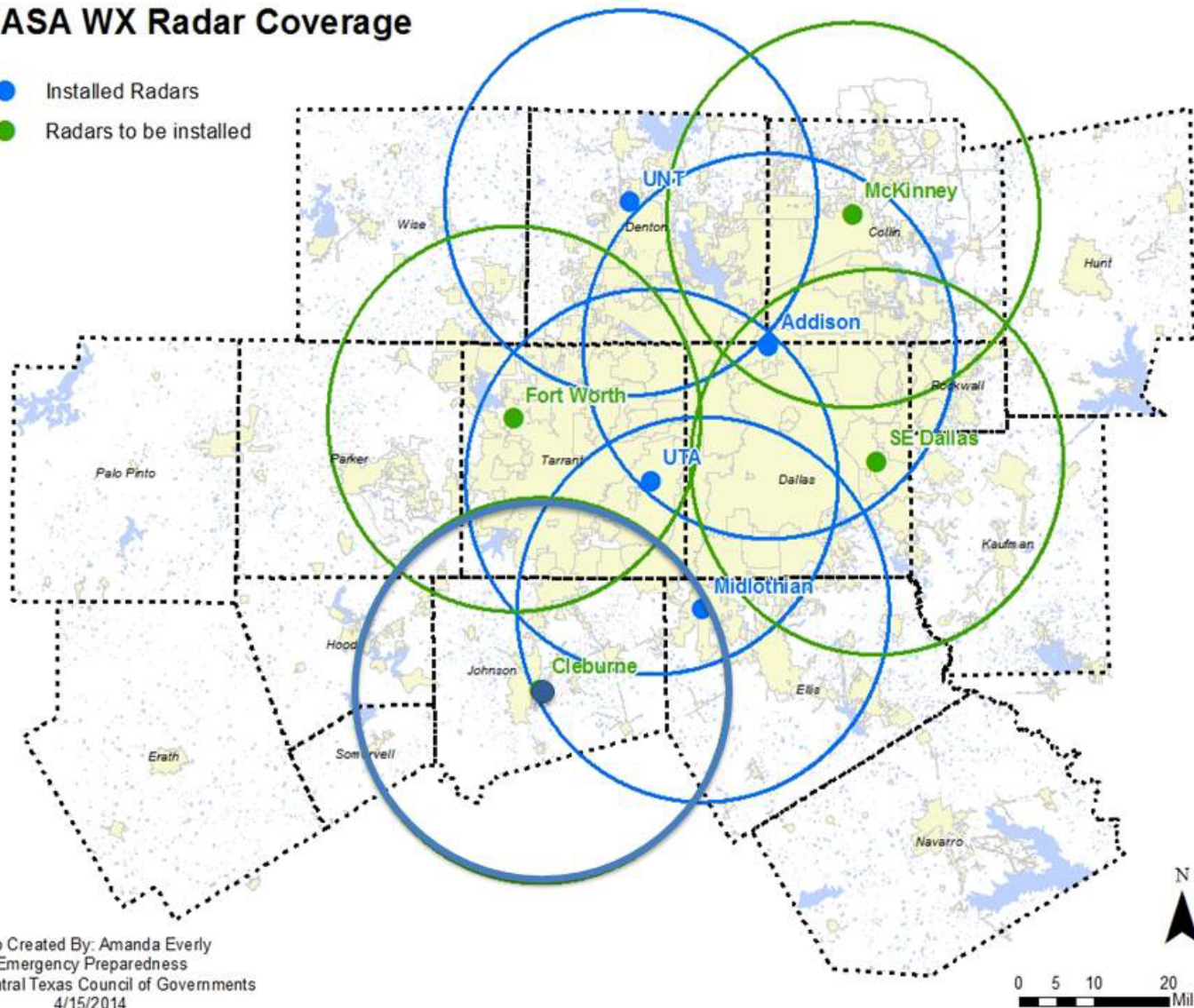
A brief tornadic spin-up in Ft. Worth observed by the UTA radar. Data is displayed on a password protected website for local jurisdictions (EMs, fire, elected officials) that pay membership fees to support radar operations.

Urban Demo Plan Radar Network
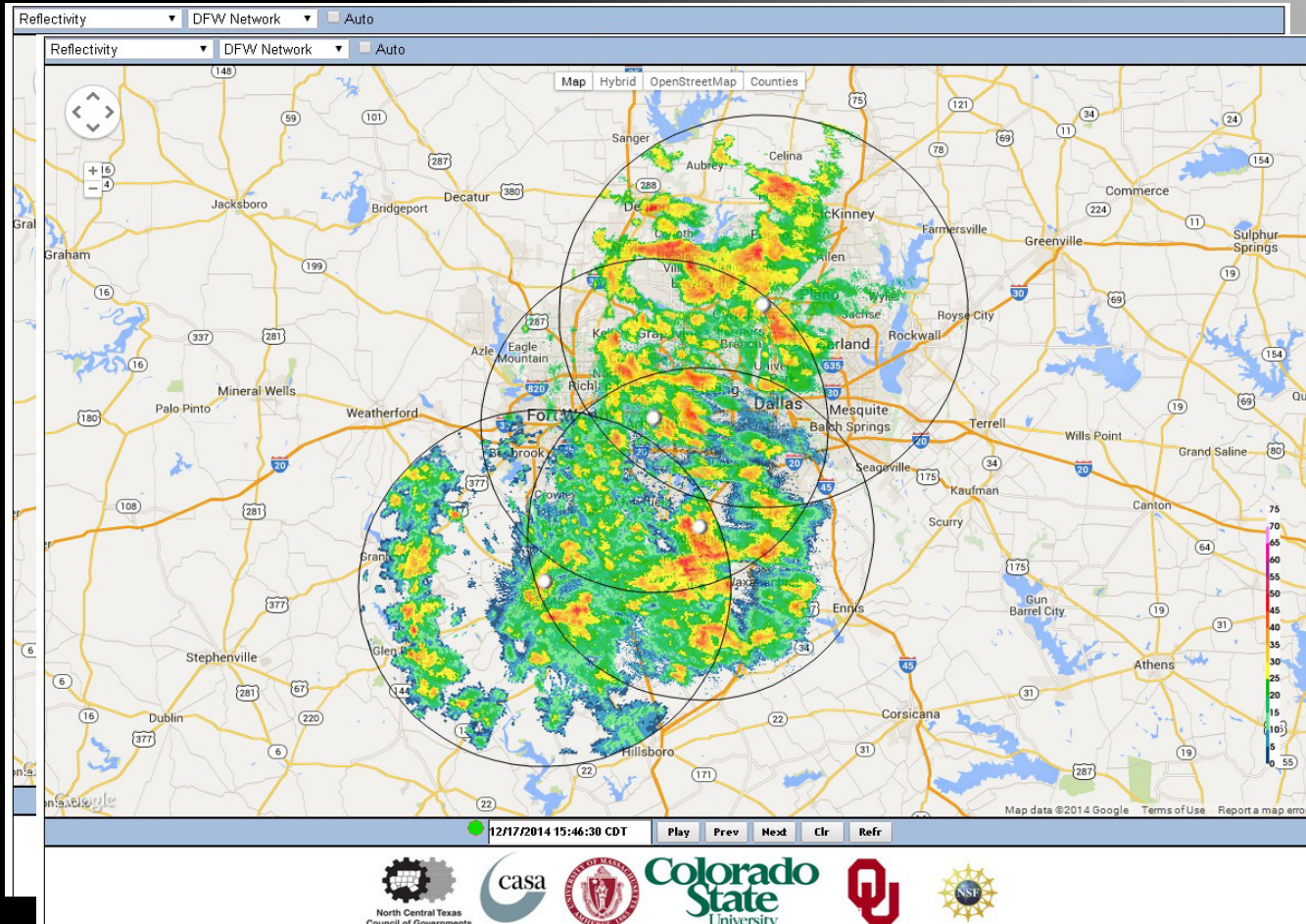

CASA WX Radar Coverage

- ● Installed Radars
- ● Radars to be installed

Map Created By: Amanda Everly
Emergency Preparedness
North Central Texas Council of Governments
4/15/2014

CASA Radar Network

Local Engagment

North Central Texas Council of Governments

Population	
0-999	$500
1,000-4,999	$1,000
5,000-14,999	$2,000
15,000-29,999	$3,000
30,000 – 49,999	$5,000
50,000 – 79,999	$7,500
80,000 – 119,999	$10,000
120,000 – 169,999	$15,000
170,000 – 249,999	$20,000
250,000 – 399,999	$25,000
400,000 – 749,000	$30,000
750,000 – 1Million +	$35,000
Counties	
Rural	$3,000
Urban	$10,000
Special Districts	$15,000

Towns and cities pay for radar deployment
and contribute to radar operations costs
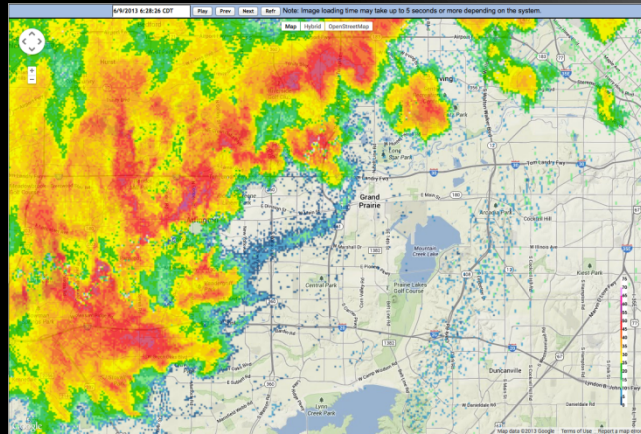
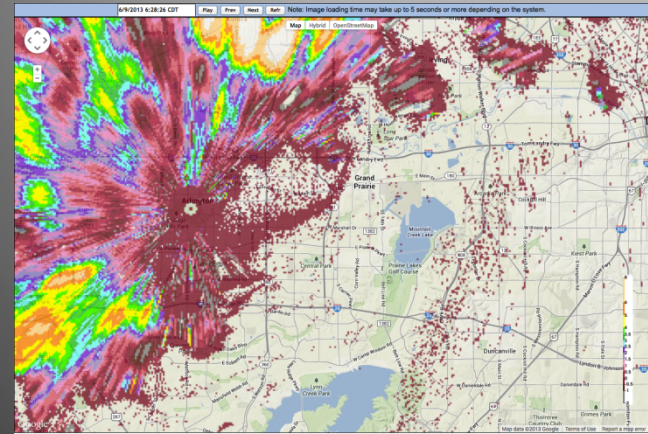# Test Bed Integrated with local stakeholders and the public

Case Study Analysis of 2014 CASA cases

- Local NWS
- Emergency Managers
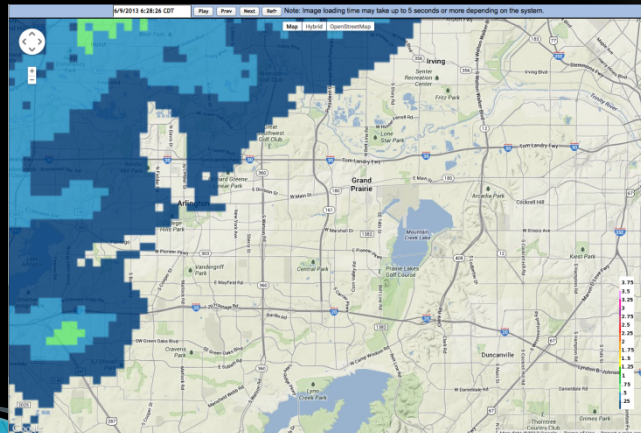- Media
- Spotters
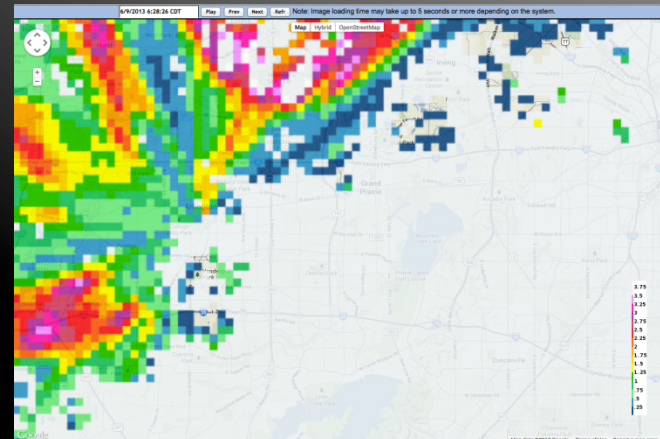- Stormwater Management
- Industry

Radar products
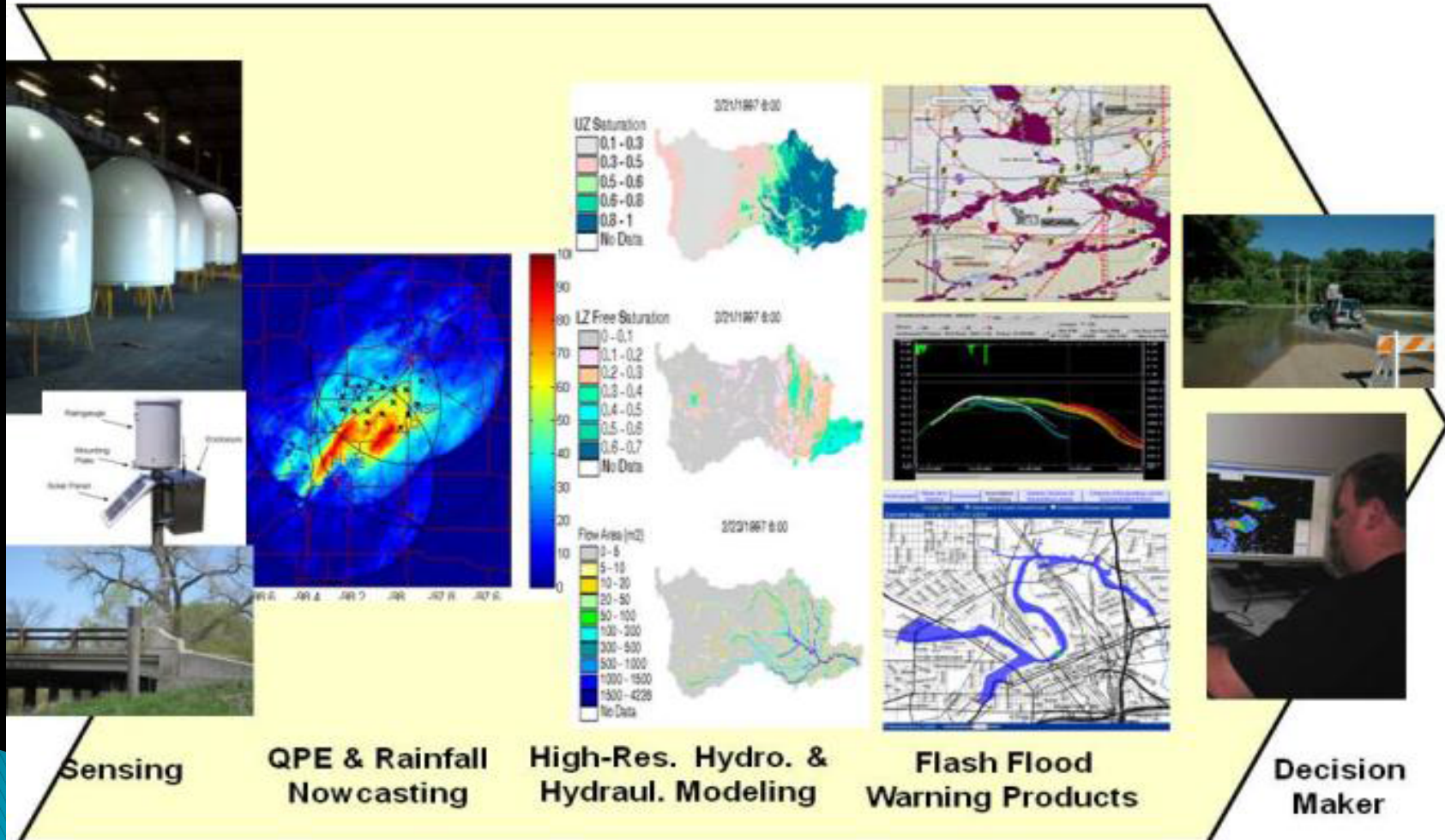

Reflectivity

KDP

Rainfall
Accumulation

Rainfall Rate

Science/Mission Benefits of the CASA Testbed

- A "Living Lab" for Severe Weather Warning and Warn-On-Forecast
- Semi-operational testing of a variety of new products obtained by fusing a combination of dissimilar sensors.
- Assessment of impact of probabilistic weather prediction of convective initiation and heavy precipitation.
- An assessment of performance impact as well as user-defined value through social science efforts.
- Demonstrate regionally-integrated decision support services.
- Increased lead time for severe weather and reduced false alarm rate.
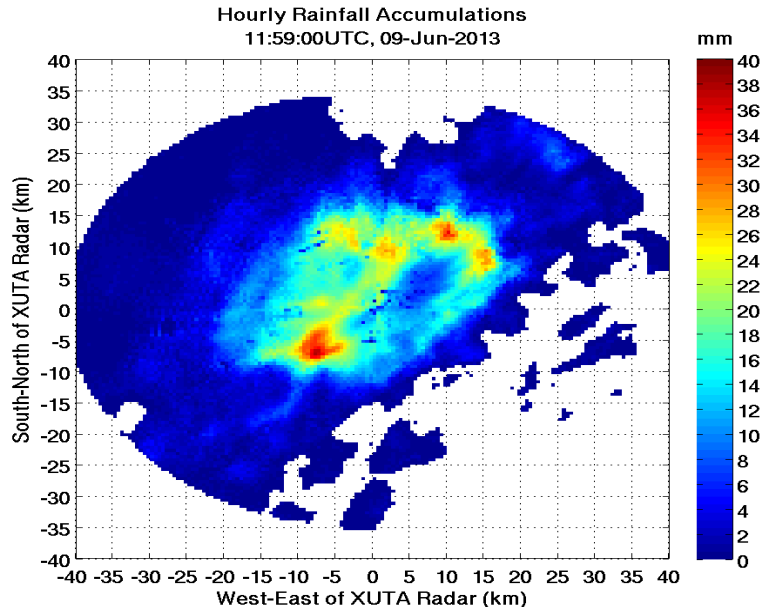- Increased lead time for urban flooding.

Project Highlights

▸ Integrated Warning System
  ◦ Next-Gen Flash Flood/Tornado Warning System
  ◦ QPE
  ◦ High-Res FF Forecasting in Fort Worth
  ◦ Motorist Behavior in Flash Floods
  ◦ Hydrometeor Classification
▸ Network of Networks
  ◦ Convective Initiation
  ◦ Dual pol data fusion
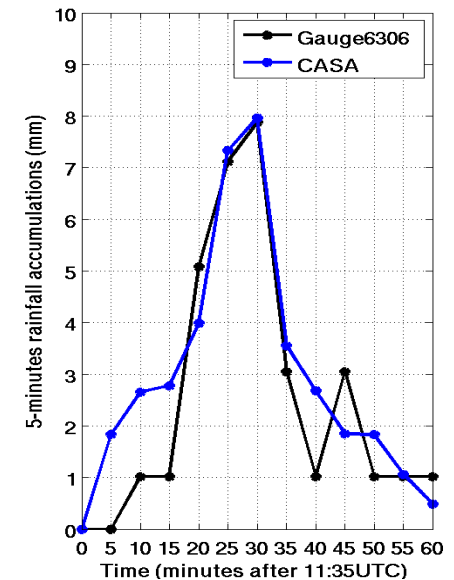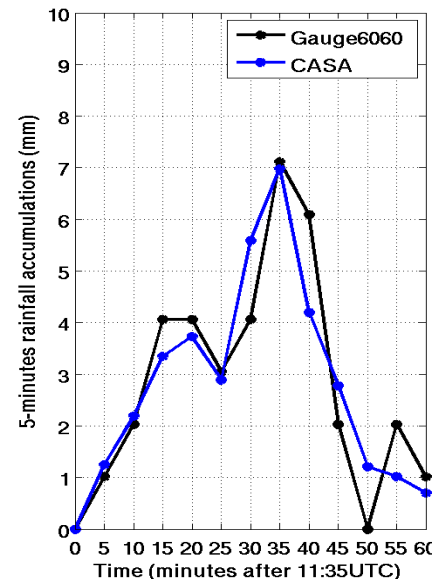 ◦ Estimating Observational Value
  ◦ Data Denial Experiments

Next Generation Warning System for Flash Floods and Tornadoes

Sensing   **QPE & Rainfall Nowcasting**   **High-Res. Hydro. & Hydraul. Modeling**   **Flash Flood Warning Products**   **Decision Maker**

QPE: Quantitative Precipitation Estimation

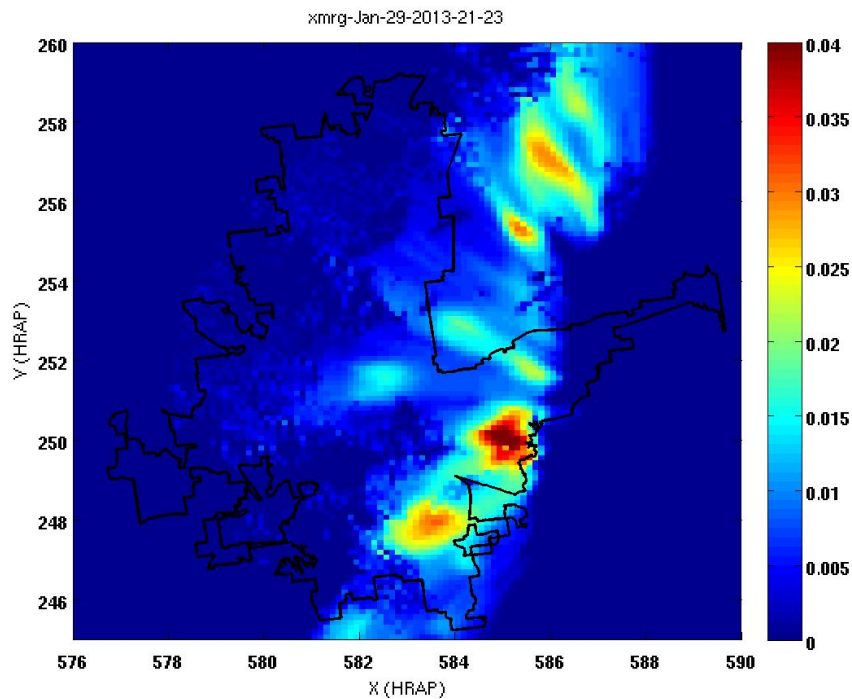Hourly Rainfall Accumulations
11:59:00UTC, 09-Jun-2013

Operational CASA product

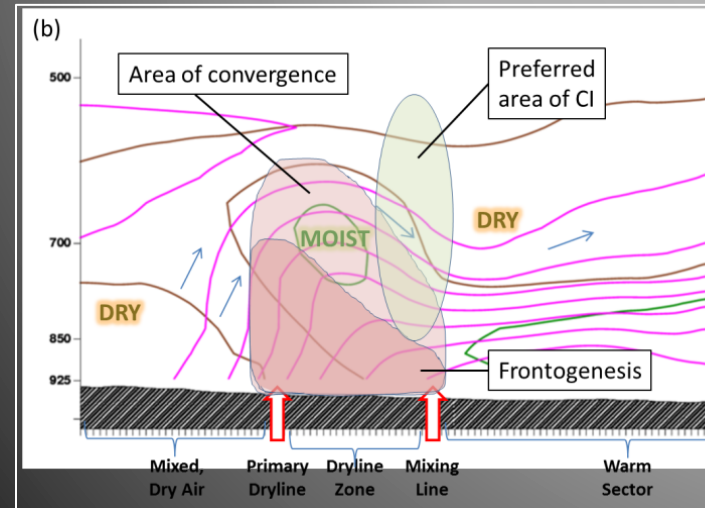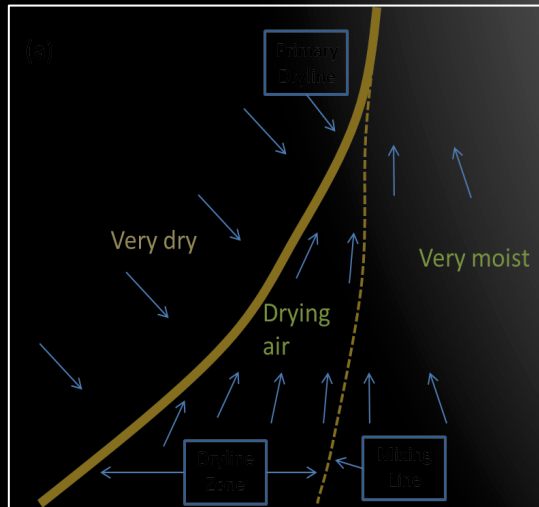CASA QPE (20 Gauges. 5 min.)
Correlation; 75.63%

Normalized Bias: −1.11
Normalized Norm−Std Err 33.49%

Hi-Res Flash Flood Forecasting: City of Fort Worth

Distributed Sacramento model is used to calculate surface runoff from CASA QPE
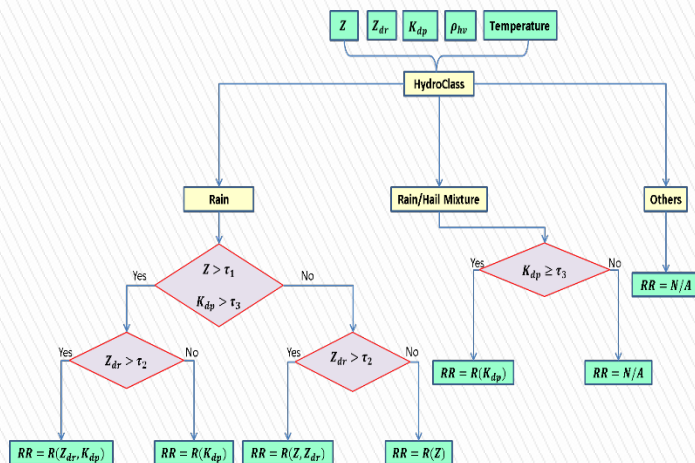
Convective Initiation

Top-down (a) and side view (b) of the revised dryline conceptual model. Note the preferred area of CI to the east of the primary dryline.
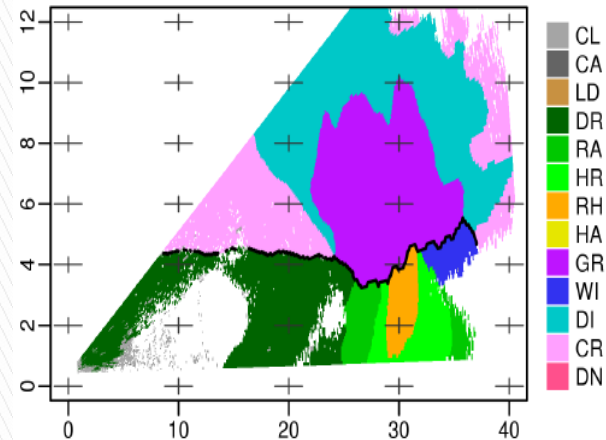
- Analyzed 4 dryline CI events
- Results have led to a new conceptual model for dryline convective initiation
- New diagnostic surface feature identified: mixing line
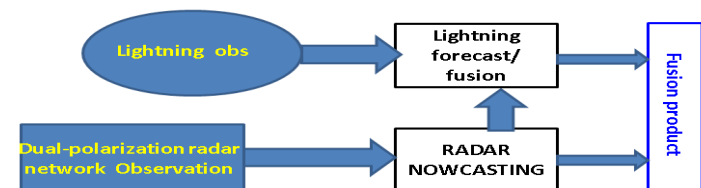
Dual Pol Data Fusion

QPE Algorithm

Hydrometeor classification

Lightning nowcast

Multi–Radar QPE
- Fuses radar data with different spatial and temporal and frequency characteristics
- Next Steps: Fused X–band, S–band QPE

Research: $6 million + new grants awarded

NWS-OST ($795k)

- Convective Initiation
- Dual Pol data fusion
- Geographically Specific Warnings
- Hydrological models (partial)
- Data denial
- AWIPS-II

Other Grants ($5M +)

- Flash Flood Warning (End-to-End)
- MCC software for mechanical radars
- Phase Tilt Radar
- Targeted mobile device warnings delivered via next gen internet architecture
- High bandwith communications
- National Mesonet Program
- Hospital Warning Systems

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(Left) High resolution tornado image captured by CASA radars on May 24, 2011 in Oklahoma. (Right) Sensor-based Multi-Doppler wind vectors at 500 meter resolution, 1 minute updates.